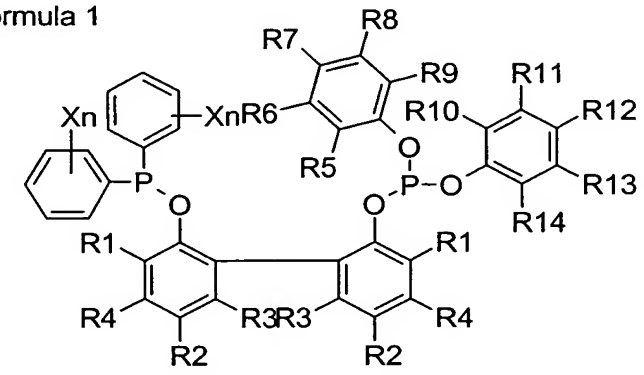
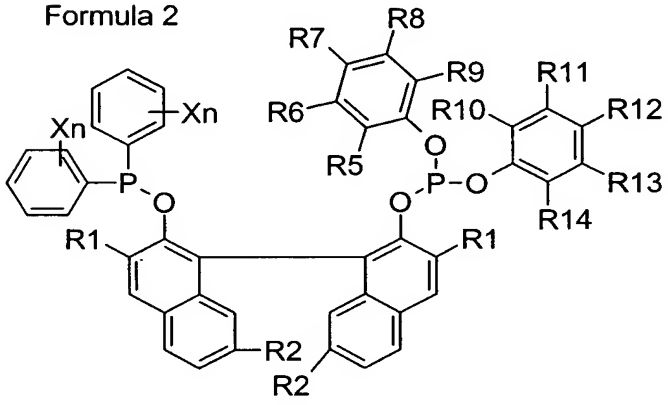
We claim:

1. A phosphinite phosphite I of the formula 1 or 2 or 3 or 4 or 5 or 6

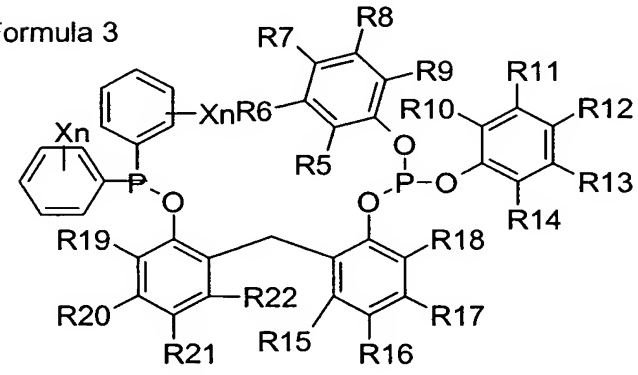
Formula 1



Formula 2



Formula 3



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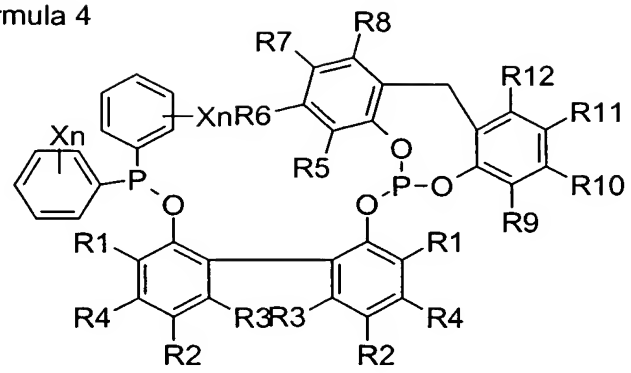

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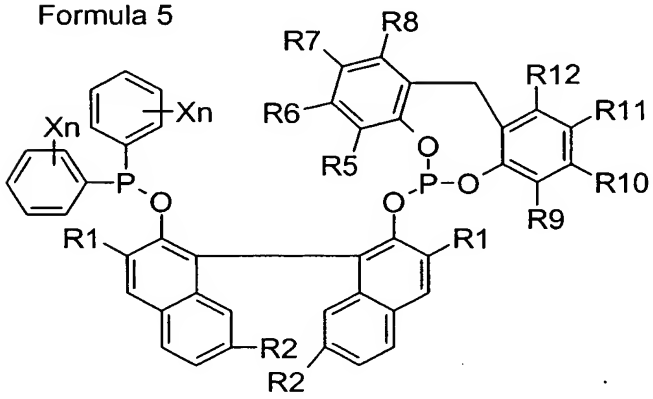
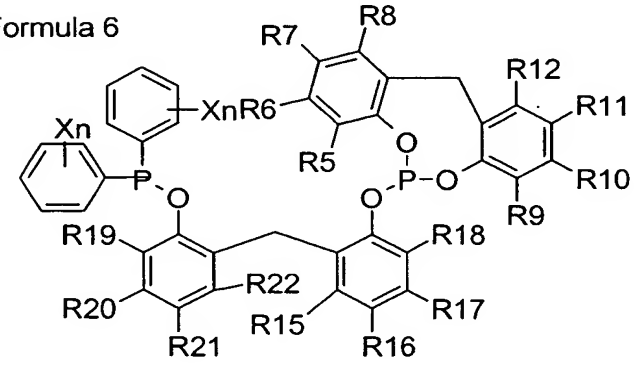


Formula 6



where

R1, R2, R4 are each independently an alkyl or alkylene group having from 1 to 8 carbon atoms, with the proviso that at least one of the R1, R2, R4 groups is not H,

R5 to R22 are each independently H, an alkyl or alkylene group having from 1 to 8 carbon atoms,

R3 is H, methyl or ethyl,

X is F, Cl or CF_3 when n is 1 or 2,

X is H when n is 0,

and mixtures thereof.

2. A phosphinite phosphite I as claimed in claim 1 where R1, R2, R4, R5, R7, R8, R10, R12, R13 are each independently selected from the group consisting of H, methyl, ethyl, n-propyl, isopropyl and t-butyl.

3. The use of a phosphinite phosphite I as claimed in claim 1 or 2 as a ligand in transition metal complexes.

4. A transition metal complex containing a phosphinite phosphite I as claimed in claim 1 or 2 as a ligand.

5. A transition metal complex as claimed in claim 4, wherein the transition metal used is nickel.

6. A process for preparing transition metal complexes as claimed in claim 4 or 5, wherein an elemental transition metal or a chemical compound containing a transition metal is reacted with a phosphinite phosphite of the formula I as claimed in claim 1 or 2.

7. The use of transition metal complexes as claimed in claim 4 or 5 as a catalyst.

8. The use as claimed in claim 7 as a catalyst for the addition of hydrocyanic acid to an olefinic double bond.

9. The use as claimed in claim 7 as a catalyst for the isomerization of organic nitriles.

10. A process for adding hydrocyanic acid to an olefinic double bond in the presence of a catalyst, wherein the catalyst used is a transition metal complex as claimed in claim 4 or 5.

11. A process as claimed in claim 10, wherein hydrocyanic acid is added to butadiene to obtain a compound selected from the group consisting of 2-methyl-3-butenenitrile and 3-pentenenitrile.

12. A process as claimed in claim 10, wherein hydrocyanic acid is added to a 3-pentenenitrile, 4-pentenenitrile or mixtures thereof to obtain adiponitrile.

13. A process for isomerizing organic nitriles in the presence of a catalyst, wherein the catalyst used is a transition metal complex as claimed in claim 4 or 5.

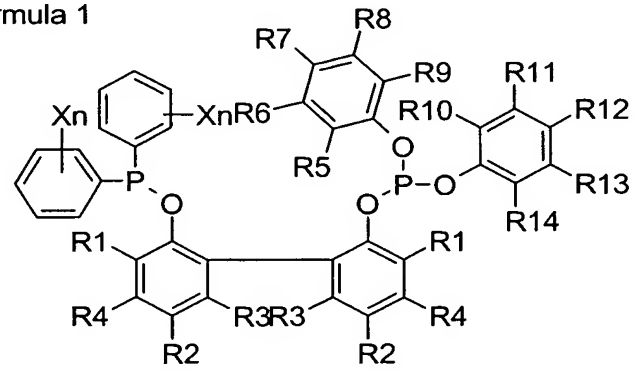
14. A process as claimed in claim 13, wherein 2-methyl-3-butenenitrile is isomerized to 3-pentenenitrile.

Catalyst comprising at least one nickel(0) complex stabilized by a sterically demanding chelate phosphinite phosphite ligand, and preparation of nitriles

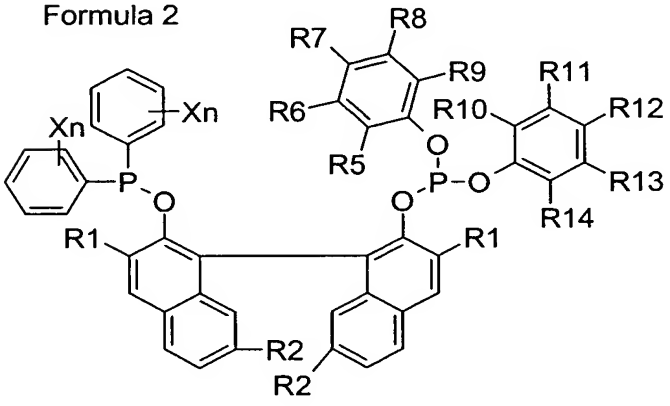
Abstract

Phosphinite phosphites 1 of the formula 1 or 2 or 3 or 4 or 5 or 6

Formula 1



Formula 2



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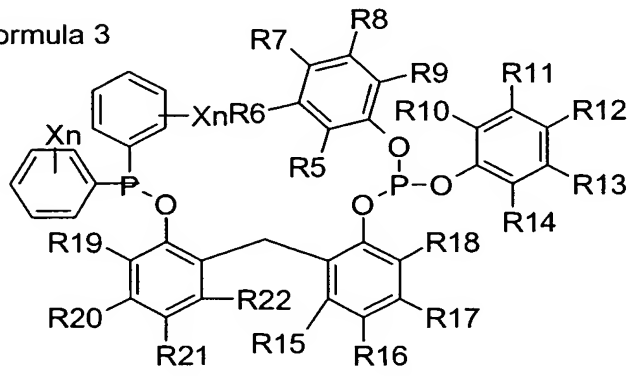

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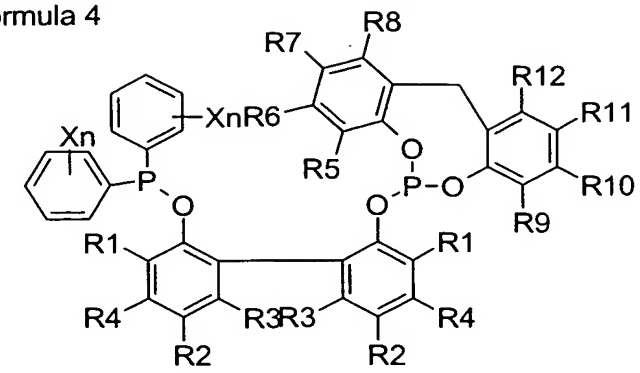
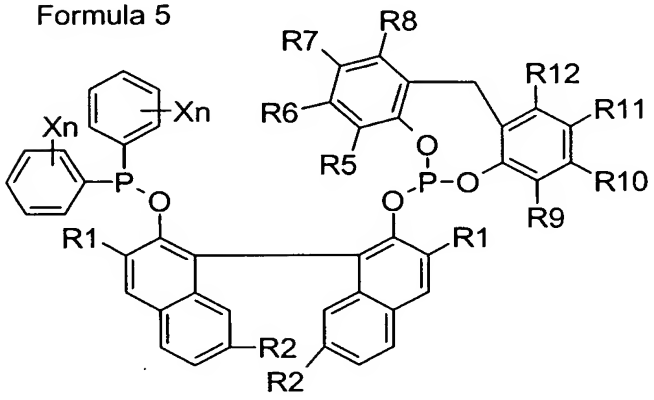
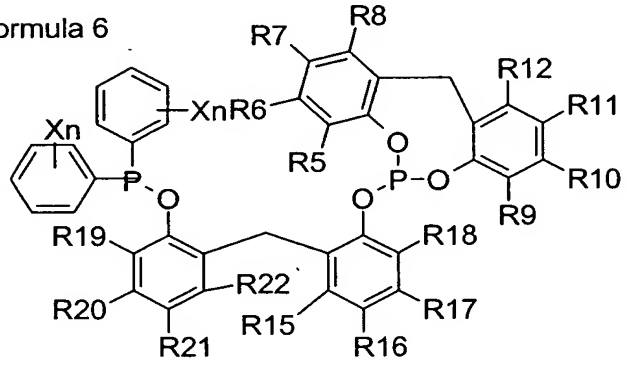


Formula 5



Formula 6



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X is H, when n is 0,

and their mixtures are described.